Groundwater Restoration at

Wyoming Uranium Solution Mining Sites

1981 -Bison Basin
40-8745
1985- 40-9076

(PART II)

By

Glenn Catchpole, Project Manager,

OPI-Western Joint Venture

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UNC Teton Exploration Drilling, Inc.

Mike Neumann, Senior Licensing Specialist,

Rocky Mountain Energy

INTRODUCTION

In the first issue of this two part article (see *The Mining Claim, June 1984)* an introduction to uranium solution mining was presented along with a review of the various groundwater restoration methods and the regulatory requirements that apply to groundwater clean-up. By way of review, solution mining is the process of recovering uranium from a water-saturated, underground orebody in a manner which leaves overlying rock strata and the land surface intact. The process involves the installation of a series of wells through which a chemical solution (lixiviant) is injected into the uranium-bearing formation, passed through the formation, and pumped back to the surface. From the recovery or production well, the uranium-bearing solution is piped to a surface plant where a series of conventional chemical processes extract uranium from the solution. The resulting solution, now barren of uranium, is then refortified with leach chemicals and reinjected into the orebody (See Figure 1). Typically, the leach chemicals consist of nothing more sophisticated (or non-toxic) than sodium bicarbonate (baking soda) and, oxygen.

Once all uranium has essentially been recovered from the orebody, groundwater affected by the leaching solution must be "cleaned up" to a condition which allows appropriate future use of the resource. Generally, regulatory agencies require that groundwater be returned to a quality as close to premining (baseline) conditions as can practically be achieved. The State of Wyoming requires that, at a minimum, groundwater be returned to a condition compatible with the premining use or potential use of the water.

The second part. of this two part series will focus on the groundwater restoration results from three Research and Development (R&D) uranium solution mining operations conducted in the late 70s and early 80s at three geographically separated sites in Wyoming. The water quality data from the three sites demonstrate that groundwater affected by solution mining activities can be restored to acceptable conditions. For background information the reader is encouraged to read Part I of this article.

REVIEW OF RESTORATION TECHNIQUES

To achieve restoration, constituents added to the groundwater for mining and those mobilized during the mining process must be removed or rendered nonmobile. In some cases, it may also be necessary to chemically treat the geologic formation in order to reverse or inhibit reactions initiated during the mining phase. The optimum restoration technique for a given site will be largely determined by inherent geologic and hydrologic conditions of that site, and observations made during the initial R&D phase. In general, however, combinations of two basic approaches have been used most extensively within the industry in Wyoming.

The first, and simplest of these techniques, is referred to as "groundwater sweep" in which both chemical constituents and groundwater are removed from the affected area by pumping selected wells. Although this technique has been successfully employed at the R&D level, several considerations may preclude total reliance on the groundwater sweep method for commercial- scale operations. Disadvantages of the sweeping method include consumptive use of large volumes of groundwater and extensive waste water storage facilities or evaporation ponds which, in turn, require large surface disturbances.

A more accepted technique utilizes treatment equipment to remove chemical constituents from the groundwater which renders the resulting water fit for reinjection into the aquifer. Several processes exist for continuous water treatment. Those processes most common to ISL restoration are reverse osmosis, electrodialysis, and ion exchange. The advantages of utilizing continuous water treatment systems in aquifer restoration, or a combination of groundwater sweeping followed by treatment and reinjection, include:

- Reduction in groundwater consumption and waste generation by up to 90 percent;
- Provides a means to direct groundwater flow in the aquifer through selective well pumping and reinjection; and
- Provides a means of introducing chemicals to the formation to reverse or inhibit continuing chemical reactions.

SUCCESSFUL CASE HISTORIES
A. Bison Basin Mine

The Bison Basin in-situ leach uranium mining project, located in southern Fremont County, Wyo., is a joint venture between Ogle Petroleum Inc. of Calif., the operator, and Western Fuel Inc., a subsidiary of the Duke Power Company. In the summer and fall of 1979 the OPI-Western Joint Venture conducted an R&D pilot scale uranium solution mining test to assess both the amenability of the orebody to in-situ mining, and the technical and economic practicality of restoration of the groundwater quality following mining.

The Bison Basin R&D project utilized sodium carbonate/bicarbonate as the lixiviant and oxygen as the oxidant. Due to the high sodium levels in the groundwater (400-500 mg/ 1) it was felt that sodium carbonate/bicarbonate would be an excellent choice of lixiviant from both a mining and restoration standpoint. The R&D wellfield consisted of four injection wells and three recovery wells arranged in a line-drive configuration, and operated at a flow rate of about 25 gallons per minute. Wells were completed within the mineralized zone of the Laney member of the Green River formation, which is of lower Eocene age.

The mining phase of the pilot operation lasted three months during which the amenability of the orebody to solution mining was adequately demonstrated. Target values for total number of pounds recovered, product purity, and quantity of uranium in solution (head grade) were achieved.

As part of the planning and procedures for the aquifer restoration phase of the project, the OPI-Western Joint Venture followed a step-by-step program designed to terminate each leaching reaction in the proper sequence. Following the sequential mining termination process, the restoration activity of circulating clean, surface treated water through the orebody aquifer was initiated. The surface water treatment system consisted of a reverse osmosis (R.O.) unit rated at 30,000 gallons per day (21 gpm).

TABLE I

BISON BASIN MINE

R & D RESTORATION DATA
(units: mg/l unless otherwise indicated)

Parameter	Average Baseline Concentration	Post Restoration Concentration	DEQ Restoration Requirement
pH	9.8	8.3	10.8
TDS	1500	1325	1650
Ammonia (as N)	0.72	-0.10 (2)	0.79
Nitrate (as N)	0.11	0.03	0.12
Bicarbonate	71.8	152.5	500
Carbonate	29.5	12.1	(3)
Calcium	36.1	53.8	500
Chloride	34.1	36.5	250
Boron	-1.0	-1.0	-1.0
Fluoride	0.95	0.79	1.04
Magnesium	4.5	8.2	5.0
Potassium	9.75	6.8	10.7
Sodium	442	390	486
Sulfate	906	773	997
Aluminum	-0.05	-0.05	-0.05
Arsenic	-0.01	-0.01	-0.01
Barium	-0.05	-0.05	1.0
Cadmium	-0.002	-0.002	-0.002
Chromium	-0.01	-0.01	-0.01
Copper	-0.01	-0.01	-0.01
Iron	-0.03	0.02	0.03
Lead	-0.05	-0.05	-0.05
Manganese	-0.01	0.04	-0.01 (4)
Mercury	-0.001	-0.001	-0.001
Nickel	-0.04	-0.04	-0.04
Selenium	-0.01	-0.01	-0.01
Zinc	-0.01	0.03	5.0
Molybdenum	-0.05	-0.05	-0.05
Vanadium	-0.05	-0.05	-0.05
Uranium	0.002	0.17	5.0
Radium-226 (pCi/l)	94.5	97.9	104

NOTES

(1) The majority of the restoration requirements are baseline plus ten percent.
(2) "-" means not detected at level indicated.

(3) The restoration requirement for total carbonate (carbonate plus bicarbonate is 500 mg/l.
(4) The 0.04 mg/ I manganese value was not considered a significant factor in the overall restoration results as 4 of the 5 restoration sampling wells had final restoration values of -0.01 mg/l for manganese

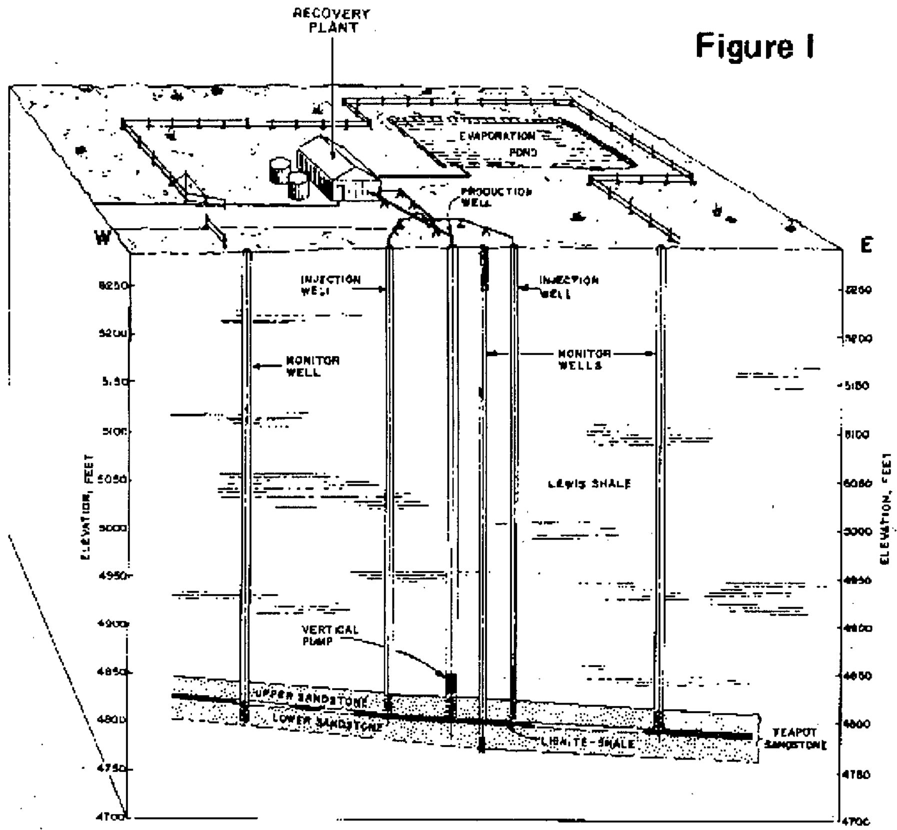


Figure I

A schematic diagram showing a typical wellfield cross section and surface facilities.

Groundwater restoration values acceptable to both the NRC and the DEQ were met in a little over one month of restoration after circulating about six pore volumes of R.O. treated water through the aquifer. A pore volume is simply an estimate of the quantity of groundwater contained within a specific volume of formation material. A total of nine pore volumes during a two month time period were eventually circulated through the aquifer to collect additional data on the slope of the restoration curves, and to obtain cost-benefit information. Table I presents the baseline and restoration water quality data at the Bison Basin R&D project.>

The two main regulatory agencies concerned with solution mining in Wyoming, the NRC and DEQ, both found the results of the OPI-Western Joint Venture aquifer restoration test acceptable which led to their respective approvals of a commercial scale license for the Bison Basin project. The DEQ expressed their approval of the restoration results in correspondence dated April 9, 1980 and May 5, 1980. The NRC expressed their approval of the restoration results in the Final Environmental Statement (FES) on the commercial scale license application (NUREG-0687).

B. Reno Creek Project

The Reno Creek R&D in-situ leach project is a joint venture between Rocky Mountain Energy Company (RME), Halliburton Company, and Mono Power, a subsidiary of Southern California Edison Company. RME operates the project which is located in southern Campbell County, approximately nine miles southwest of Wright, Wyo. Uranium in this portion of the Powder River Basin is found within the Wasatch Formation of Tertiary Age, as a typical roll front deposit.

Testing to evaluate the amenability of the ore deposit to solution mining with a sodium carbonate/bicarbonate lixiviant began in October of 1980. The wellfield consisted of two recovery wells ringed by four injection wells and an outer ring of monitor wells. This well configuration is known as a modified "five-spot pattern," illustrated in Figure 2.

Leaching operations were conducted over a 10-week period during which the feasibility of recovering uranium using a sodium carbonate/bicarbonate lixiviant was confirmed. Groundwater restoration began in December 1980 by pumping production fluid from the wellfield through the surface plant facilities where an ion exchange (IX) process was used to remove undesirable constituents. This process continued for a one-month period and was followed by a groundwater sweep which also continued for about one month.

At the close of the restoration program, all groundwater constituents, except uranium, were restored to levels below or within baseline ranges. Uranium was reduced to less than five parts per million which is the standard for drinking water in Wyoming. This was accomplished through the circulation of about seven pore volumes of groundwater through the aquifer. Total groundwater consumption during restoration was equivalent to 5 pore volumes or 1.3 million gallons. A representative comparison of premining and restored groundwater quality is shown on Table 2.

Groundwater restoration and stabilization monitoring data were thoroughly evaluated by the Land and Water Quality Divisions of the DEQ and by the NRC. Both agencies concluded that the goal of restoring groundwater to premining baseline conditions was achieved for all parameters except uranium which met WDEQ's water use class standards. Further, the NRC and DEQ acknowledged that restoration results would be suitable to support commercial-scale operations at Reno Creek. See copies of DEQ and NRC correspondence approving the restoration results pages 18 and 19.

C. Leuenberger Project

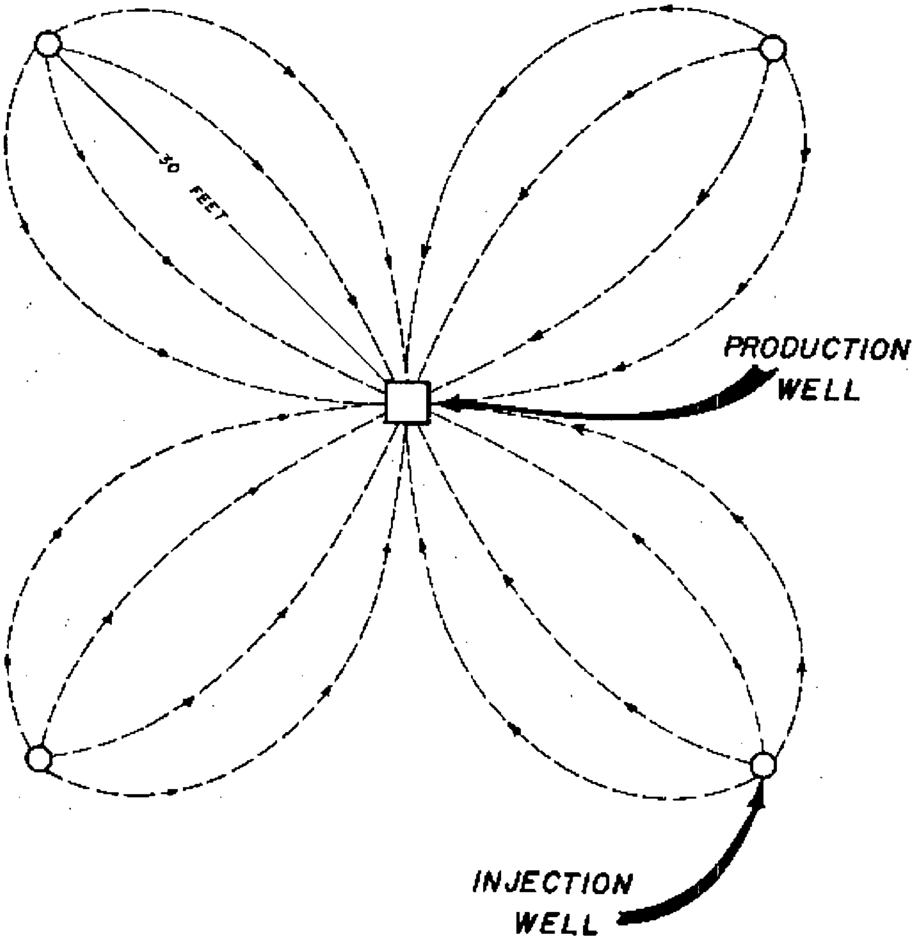
The Leuenberger site is located approximately seven miles northeast of Glenrock in the southern portion of the Powder River Basin. The R & D project was originally a joint venture between NEDCO and UNC Teton, operator, designed to evaluate the feasibility of solution mining within the Fort Union Formation of Paleocene Age.

UNC Teton began test operations in April 1979 also using a sodium bicarbonate/carbonate lixiviant. Uranium mineralization within this portion of the Fort Union Formation frequently occurs as "stacked" or layered zones in different sand units so two separate test patterns were constructed at different depths. Both wellfield configurations were typical five-spot patterns consisting of four injection wells surrounding a central recovery well (see Figure 2).

The first of the patterns to undergo active groundwater restoration was the N sand which is the shallower sand unit. The test pattern was successfully restored using a groundwater sweep method initiated June 1980 and completed in November 1980. Following a 14-month groundwater stability monitoring period, DEQ agreed that the aquifer restoration had been effective and met license requirements. Although restoration was successful, groundwater consumption was high due to the sweep method.

Leaching operations within the lower ore zone, or M sand, were terminated in February 1981 after confirming the viability of uranium recovery using the sodium bicarbonate/carbonate lixiviant. The restoration program was designed to recapture all groundwater affected by leaching constituents while minimizing the consumptive use of groundwater. This was accomplished through the use of electrodialysis (ED) treatment which is basically a water purification process. The ED concentrates undesirable groundwater constituents into an effluent or brine for disposal and produces "clean" water which can be reinjected into the wellfield.

Figure II



Typical 5-spot well pattern.

By the end of the restoration program, approximately half (46 percent) of the affected groundwater recovered from the pattern was sent to the ED unit for treatment. Of this amount, approximately 8 percent was disposed of in an evaporation pond. The ED product, or "clean" water was then mixed with untreated groundwater from the pattern and reinjected to improve overall groundwater quality. The total restoration process resulted in the consumption of 1.7 million gallons of groundwater which represents a 90 percent improvement in water conservation compared to the groundwater sweep method.

Restoration was terminated in December 1981 when water quality in all pattern wells was at or below restoration goals contained in the R & D permit. Comparison of baseline and post restoration water quality indicated that all parameters except radium were restored to specified levels or well within baseline water quality ranges. Radium levels were reduced to an average of 350 pCi/l compared to a baseline average of 185 pCi/I. Wyoming DEQ standards for Class I (Domestic), Class II (Agricultural), and Class III (Livestock) groundwaters are 5 pCi/ 1.

Therefore, post restoration radium levels did not impair groundwater use suitability.

The Final Environmental Statement (FES) prepared by the NRC for the commercial-scale license application concluded that " . . . the applicant has demonstrated that restoration of the ore zone aquifers to their original potential use condition is achievable."

Reno Creek

Pattern 2 Production Wells

Restoration Data

Parameter (1)	Baseline Range	Well P-10	Well P-11
		4/1/82	4/1/82
		NML ------- CDM	NML ------ CDM
Field			
pH	8.2 - 8.9	7.6 ------ 8.1	7.7 ------ 8.0
Conductivity	1890 - 2234	2000 ------ 2500	1990 ------2400
Major Constituents			
Bicarbonate (HCO3)	89 - 1780	187 ------ 160	159 ------ 130
Carbonate (CO3)	0 - 14	0 ------ 0	0 ------ 0
Alkalinity (as CaCO eq)	73 - 146	153 ------130	130 ------110
Calcium	108 - 153	118 ------ 110	92 ------ 105
Chloride	7.0 - 18.8	18 ------ 11	16 ------ 12
Magnesium	19 - 33	17 ------ 25	16 ------ 22
Potassium	5.8 - 9.5	7.5 ------ 8.1	6.8 ------ 7.3
Sodium	287 - 360	295 ------ 350	282 ------ 330
Sulfate	818 - 1002	783 ------ 960	644 ------ 910
TDS	1340 - 1580	1330 ------ 1510	1160 ------ 1410
Anion/Cation Balance	-	101 ------ 99	105 ------ 101
Minor Constituents			
Ammonia (as N)	<0.2	<0.2	<0.2
Nitrate (as N)	<0.05	<0.05	<0.05
Nitrate (as N)	<0.05	<0.05	<0.05
Aluminum	<0.2	<0.5	<0.5
Arsenic	0.001 - 0.016	0.006	0.007
Barium	0.08 - 0.40	<0.2	<0.2
Boron	<0.1	<0.1	<0.1
Cadmium	0.01 - 0.02	0.012	0.009
Chromium	0.02 - 0.11	<0.005	<0.005
Copper	0.01 - 0.02	<0.005	<0.005
Fluoride	0.09 - 0.15	0.1	<0.1
Iron	0.03 - 0.61	0.08 ------ 0.13	0.03 ------ 0.08
Lead	0.03 - 0.11	<0.005	<0.005

Manganese	**0.01 - 0.14**	**0.068**	**0.071**
Mercury	**<0.0001**	**0.001**	**0.0001**
Molybdenum	**0.01 - 0.11**	**0.008**	**0.011**
Nickel	**0.01 - 1.10**	**0.02**	**<0.02**
Selenium	**0.009 - 0.017**	**<0.005**	**<0.005**
Vanadium	**0.05 - 0.34**	**0.39**	**0.43**
Zinc	**0.01 - 0.09**	**<0.005**	**<0.005**
Radiochemistry			
Uranium (1)	**0.012 - 0.287**	**3.51 ------ 3.5**	**2.11 ------ 2.3**
Radium-226	**106 - 768**	**320**	**250**
Thorium-230	**0 - 1.9**	**6.1**	**31**

All values expressed as mg/I except pH (standard units), conductivity (umhos/cm), radium and thorium (pCi/1).
Baseline range is for all pattern production zone wells following outlier
removal.
NML values are U308; CDM values are U nat.

Conclusion

In-situ leaching of uranium is a mining method undergoing rapid technological development. Experience to date confirms that this method can compete favorably with traditional open pit or underground mine operations from an economical standpoint. An advantage of solution mining is that surface facilities and disturbances are significantly less extensive than those associated with open pit or other surface mining methods. Consequently, protection of groundwater resources is of greatest environmental concern, particularly the restoration of affected groundwater to premining conditions. At least three different operators in Wyoming have demonstrated, in different geographical and geological settings, that groundwater restoration to the original use suitability can be achieved.

Domestic marketplace requirements for uranium are currently quite depressed as imported uranium is readily available and utilities are deferring construction on existing and proposed power plants. When market demand increases, however, the domestic industry is expected to rely heavily on in-situ mining as an economical means of production. As documented in this article, the mining industry has shown that in-situ mining can be done in an environmentally acceptable manner which protects land and water resources for future use.

Final Environmental Statement

related to the operation of
Bison Basin Project

Docket No. 40-8745

Ogle Petroleum, Inc.

U.S. Nuclear Regulatory Commission
Office of Nuclear Material Safety and Safeguards
April 1981

(This is one page of the above titled document.)

Restoration baseline for each parameter shown in Table 3.22 shall be the highest value obtained from three rounds of samples (four rounds, at NRC option, if significant variation has occurred) collected from all of the restoration baseline monitoring wells in each well-field unit, except that baseline for radium-226 shall be established on a well-by-well basis following the same sampling procedure. In comparing restoration determination values with baseline values, the average of each parameter for each round of samples from the restoration monitoring wells must be equal to or less than the baseline value.
In the event that significant variation in water quality is indicated during baseline sampling or during restoration determination sampling, the NRC reserves the option to require well-by-well restoration determination.

4.3.2 **Applicant's restoration test**

Starting August 5, 1979, approximately one nominal pore volume was pumped from the pilot well field to the evaporation pond. This operation, completed on August 9, 1979, represented the lixiviant that would be transferred to a new well field during commercial operation. From August 10 through September 14, 1979, fluids from the recovery wells were routed to a reverse osmosis (RO) unit. The clean water from the RO unit was reinjected into the pilot well field, and the concentrated brine from the RO unit was discharged to the evaporation pond, as would be the case for commercial-scale wellfield restoration.

The results for the major ionic constituents from production well P-22 are shown in Fig. 4.2. The restoration test demonstrated that staff objectives for restoration could be realized. Bicarbonate and chloride exceed baseline as shown in Fig. 4.2, because neither is at levels unacceptable for any water use. (For public drinking water, the chloride maximum is 250 mg/liter, and no standard exists or is needed for bicarbonate.)

Conductivity, a reasonable measure for total ionic content, was restored to baseline after a nominal five pore volumes of RO treatment.

None of the minor constituents or trace elements exceeded drinking water standards after restoration.

Monitoring through March 18, 1980, showed either no increase or an insignificant increase for the constituents in monitored wells (Fig. 4.1). Radium-226 exceeded applicable standards both before and during mining.

The applicant calculated the nominal pore volumes of 437 in' (115,000 gal), using only 0.6 to 0.76 in (2 to 2.5 ft) for lixiviant penetration from the well bore external to the well-field dimensions. From a cursory material balance for sulfate, chloride, and sodium ions over the restoration phase, the staff estimates that at least twice this pore volume was affected by the lixiviant during mining. The staff conclusion is that fewer treated pore volumes will be needed for restoration than appears necessary from Fig. 4.2 because the percentage volume affected external to the injection well perimeters decreases radically with an increase in well-field area. The applicant was able to reinject only 62% of the RO unit input. An estimated improvement to 90% reinjection would further reduce the treatment pore volumes required.

4.3.3 Staff conclusions

In the opinion of the staff, the applicant has demonstrated that restoration of the aquifer to its original potential use condition is achievable. The staff believes that the applicant can improve RO unit performance to achieve 90% reinjection; this improvement would reduce the water consumption for restoration as well as the evaporation pond volume and surface requirements. The staff considers it necessary for the applicant to mine sequentially, commencing restoration of each mined-out area as mining begins on the next mine area or as soon as feasible. Sequential mining will be a condition of the license.

The staff's conclusion is that this proposed operation is state-of-the-art and, with monitoring and proposed mitigating measures, will pose no major risk to the environment.

MEMORANDUM

TO FILE: License to Explore No. 38
FROM: Ed Francis, District III Engineer
DATE: April 9, 1980 (Finalized May 5, 1980)

SUBJECT: Restoration Report Response. Refer to Ogle's Final Restoration Report of May 2, 1980.

COMMENT:*

Radiological results from Land Quality Division sampling are not available at this date. This report will be finalized upon receipt of radiologic data.

See Hereford memo of April 11, which comes to similar conclusions through mathematical and graphic analyses.

SUMMARY

Upon Ogle's request for a Land Quality Division decision concerning satisfaction of Ogle's groundwater restoration, District III undertook a three- fold analysis of the restoration situation:
1. Statistical analysis of restoration sampling results versus baseline results.

a. Evaluation of specific values for individual species.

b. Analysis of mean value comparisons.

2. Value by value comparison between final round and baseline means.

3. Analysis of environmental implications of those species determined to be more than 10% out of range of baseline conditions.

The conclusions from the above studies are that Ogle Petroleum, Inc., has demonstrated capability to restore groundwater to an acceptable quality of original use following sodium bicarbonate leaching. Technology used was reverse osmosis and reintroduction of treated water into the aquifer. Declaration of capability has no relevance to bond release (which is not sought) because this declaration has nothing to do with surface reclamation, which is not intended at this time.

*Radiological data was obtained by phone on 5-5-80. LQD results served to confirm (even enhance) the Ogle data. As a result of this confirmation, this report stands as the final report documenting restoration capability.

THE STATE OF WYOMING

ED HERSCHLER
GOVERNOR

Department of Environmental Quality

LAND QUALITY DIVISION

401 WEST 19TH STREET TELEPHONE 307-777-7756 CHEYENNE, WYOMING 82002

May 4, 1983

J.A. Yellich
Rocky Mountain Energy Corp.
10 Longs Peak Drive
Box 2000
Broomfield, CO 80020

MAY 11 1983

RE: Reno Creek Project, Permit No. 479

Dear Mr. Yellich:

On the basis of information supplied by your company and on the basis of confirmation water samples taken by Land Quality Division staff on February 8 and 9, 1983, the Land Quality Division finds that restoration of the groundwater within the Pattern II well field has met applicable groundwater use classification standards as required by the permit.

Therefore, Rocky Mountain Energy is released from any further aquifer and groundwater restoration for the Pattern II well field and the bonding requirements thereof.

The Department of Environmental Quality and the Land Quality Division recognizes that although the Reno Creek Project was permitted as a regular mining permit, the intent of the project was research and development on the feasibility of various well patterns and lixiviants in a Wasatch ore body.

The restoration results for Pattern II show that pre-mining baseline conditions have been achieved for all parameters except uranium and that element's concentration has been reduced to a level within Water Quality's classification of use standards.

It is felt that during commercial-scale operations, mining will be carried further to completion and uranium levels will be reduced to levels below those presently found in Pattern II.

Accordingly, the Land Quality Division acknowledges that the feasibility of groundwater restoration using a carbonate-based lixiviant has been demonstrated at the Reno Creek Project's Pattern II. From this test, it would appear that a properly designed in-situ leach operation of commercial scale would be environmentally acceptable if it used a carbonate-based lixiviant.

I have contacted the NRC on this decision and they have indicated that they will be taking concurrent action.

Please be advised that any changes you desire to make to Bond No. 3427761 should be coordinated through Rick Chancellor of the Sheridan District Office.

Sincerely,

Robert E. Sundin

Robert E. Sundin
Director
Department of Environmental Quality

RES:dlw
cc: Rick Chancellor
Bill Garland
John Linehan

THE STATE OF WYOMING

WESTERN JOINT VENTURE
MAY - 7 1980

ED HERSCHLER
GOVERNOR

Department of Environmental Quality

LAND QUALITY DIVISION

~~STATE OFFICE BUILDING~~
401 West 19th Street

TELEPHONE 307-777-7756

CHEYENNE, WYOMING 82002

May 5, 1980

Mr. Glenn J. Catchpole
Project Manager
Bison Basin Project
Ogle Petroleum, Incorporated
150 North Nichols Avenue
Casper, WY 82602

RE: License to Explore No. 38

Dear Mr. Catchpole:

The Land Quality Division has received your Final Restoration Report written April 29, 1980 and accepts the report as written. Enclosed are memoranda detailing results of analyses of independent samples obtained on March 6, 1980 in your company and an independent analysis of OPI's data confirming restoration of the R & D area. It is interesting to note that the Land Quality Division independent laboratory is generally lower in individual values than the OPI laboratory on the final sample round.

If there is any question concerning this restoration declaration or the enclosed memoranda, please contact us.

With Best Regards,

Joe Hereford

Joe Hereford
District III Environmental Specialist

JH:lv

Enclosure

RECEIVED JUN 2 [illegible]

UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
URANIUM RECOVERY FIELD OFFICE
BOX 25325
DENVER, COLORADO 80225

JUN 17 1983

URFO:FWR
Docket No. 40-8797
04008797090E

Rocky Mountain Energy Company
10 Longs Peak Drive
Box 2000
Broomfield, Colorado 80020

Gentlemen:

The NRC staff has reviewed your July 16, 1982 submittal on final groundwater stabilization data for test Pattern II at the Reno Creek R&D facility. Based on your data and the analytical results from confirmation samples taken by the WDEQ in February 1983, the staff concluded that, with the exception of uranium, the restoration objective of returning all parameters to within baseline ranges has been met. Although uranium concentrations within the wellfield exceed baseline, they are at levels which meet all WDEQ water use class standards.

The restoration of Pattern II demonstrates your ability to restore groundwater within the ore zone aquifer at Reno Creek using sodium-based carbonate lixiviant to a level that would support an application for a commercial scale license. However, if commercial scale mining is pursued at this site, it is expected that at the completion of commercial-scale operations, uranium can be returned to concentrations lower than those currently in Pattern II.

RME may abandon all Pattern II wells using methods approved by the State of Wyoming.

Sincerely,

R. Dale Smith, Director
Uranium Recovery Field Office
Region IV

Home